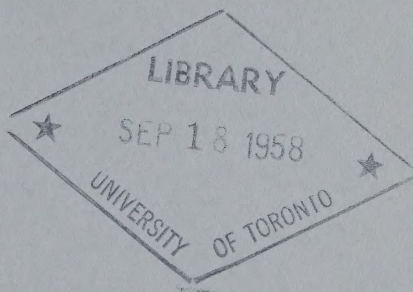


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Canada. Mines, Bureau of. Explosives
Division



Canada
Department of Mines
and Technical Surveys



Annual

Report of the

EXPLOSIVES

DIVISION

Calendar Year
1957



Canada
Department of Mines
and Technical Surveys

Report of the

EXPLOSIVES
DIVISION

Calendar Year 1957

by
H. P. Kimbell
Chief Inspector

Cat. No. M81-57

Available from the Queen's Printer

Ottawa, Canada.



The ballistic mortar at the Explosives Division laboratory, Ottawa.

The mortar, which is similar to the firing chamber of a cannon, swings at the end of a pendulum suspended from the room-high concrete structure shown. When a sample charge of about $\frac{1}{3}$ oz. is detonated in the mortar, the pendulum recoil is measured against the known recoil of a standard explosive.


This is part of the equipment used by the Division to test explosives intended for use in Canada. All commercial explosives used in this country must be authorized under the Explosives Act.

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The Explosives Division exists solely in the interests of public safety. Its function is to administer the Explosives Act, an Act which controls, by a system of licences and permits supported by inspection, the manufacture, authorization, sale, storage, and importation of explosives, as well as transportation of explosives by road.

Offices and Staff

The Division's main office is at 238 Sparks Street, Ottawa and it maintains branch offices at 739 West Hastings Street, Vancouver 1, B.C. and at 7 Terminal Road, Halifax, N.S. Advice regarding the Explosives Act may be obtained at any of these offices but all applications for factory and magazine licences, certificates for registered premises, and permits to import and transport explosives should be addressed to the Chief Inspector of Explosives, Explosives Division, Department of Mines and Technical Surveys, 238 Sparks Street, Ottawa. The Division's testing laboratory is on the River Road, near Uplands Airport on the outskirts of Ottawa.

The year 1957 was the second successive year during which the Division has operated with a deficiency of one Inspector but this will be corrected early in 1958. In addition to the Chief Inspector, inspection staff included four inspectors and ten clerical personnel. Clifford B. Mohr, a chemist on the staff since 1937, retired on superannuation in October. The laboratory staff now consists of two chemists, a technician and a stenographer. Total staff thus numbered nineteen.

Ammonium Nitrate and Fuel Oil Order

An unexpected development of 1957 resulted in passage of the Ammonium Nitrate and Fuel Oil Order by Order in Council P.C. 1957-335 of 14 March, 1957. An Ontario company engaged in open-pit mining requested permission to blast with a mixture of ammonium nitrate and fuel oil, introducing the two ingredients separately but simultaneously into drill holes. The applicant submitted that this mixture, used in conjunction with a fixed explosive as a booster, had been used successfully in the United States and had resulted in considerable savings in costs. With the concurrence of the Chief Inspector of Mines for Ontario, permission for trials was given and, when they proved successful, ammonium nitrate blended with fuel oil was declared an authorized explosive and the Ammonium Nitrate and Fuel Oil Order was passed. It is published herein as Appendix A.

It has of course long been known that sensitized ammonium nitrate constitutes an explosive but this Division found it surprising that drill-hole blending, without mixing equipment of any kind would give satisfactory and consistent blasting results. That it has done so is attested by the fact that ninety-four letters of permission have been sent under the Order. Users are chiefly operators of open pit mines and quarries but there have been some applications from construction companies engaged in excavation and similar operations.

Although this "field-blending" of ammonium nitrate and fuel oil has definite limitations, the development has had considerable impact on the explosives industry. The mixture is relatively insensitive and there has

Explosives Division

been no record of accident. It is important to emphasize however that the risk of fire is ever present and all normal safety precautions, such as apply in the handling and use of any fixed explosive, must be rigidly observed.

Authority for the Order comes from Section 8 of the Act which allows, under certain conditions, "the inexplusive component parts of an authorized explosive to be assembled and blended at or near the place of use". It is of historical interest to note that Section 8 has never before been invoked. When the Act was first passed in 1914 Section 8 was included to legalize the Sprengel explosive "Rack-a-Rock" then being manufactured in Sherbrooke, Que. Proclamation of the Act was deferred until after the war, 1920, and by that time manufacture of Rack-a-Rock had ceased.

There was no other legislation during the year.

Manufacture

A list of licensed explosives factories is given as Appendix B. The year was marked by commencement of dynamite production by DuPont Company of Canada (1956) Limited at the new factory near North Bay, Ontario which had been under construction since 1955. The new plant is known as Nipissing Works, and was officially opened with due ceremony on 19 July. Being the most recently built, it is of course the most modern of the six factories now manufacturing commercial nitroglycerine explosives in Canada. Safety has received prime consideration in its layout and design.

The "Amex" factory of Canadian Industries Limited at Sept Iles, Que. operated for part of the year only. Since 1955 it has manufactured an ammonium nitrate explosive which has been superseded by the field-mixing development referred to previously in this report.

Reflecting the generally thriving condition of Canadian industry and business, the production of commercial blasting explosives again showed a sharp increase over the previous year. Production rose to 169,492,000 pounds compared with 148,080,000 in 1956. This takes no account of the explosives mixed at the site of blasting under the Ammonium Nitrate and Fuel Oil Order.

Licences, Permits and Certificates

The following were issued during the year; comparative figures for 1956 are shown in brackets:

Factory Licences.....	20 (19)
Magazine Licences (storage for sale)....	458 (466)
Temporary Magazine Licences..... (storage for private use)	939 (978)
Registered Premises Certificates..... (storage of small quantities for sale)	122 (109)
General Importation Permits (one shipment only).....	1252 (1142)
Annual Importation Permits.....	39 (21)
Transportation Permits (by road only)..	242 (270)

Report for 1957

The explosives imported under the above-noted importation permits are detailed in Appendix C. The Class 3, Division 2 explosive listed as "for other manufacturing purposes" is mainly nitrocullulose used in manufacture of such products as lacquers, coated fabrics and films.

Annual import permits cover any number of shipments during a calendar year but are limited by regulation to certain specified explosives such as distress signals and highway fusees.

Inspections

The number of inspections carried out during the year was as follows:

Factories.....	37
Magazines.....	2,036
Registered Premises.....	182
Unlicensed Premises.....	166
Transportation.....	72

These figures include the inspections carried out by Deputy Inspectors of Explosives of the RCMP, as well as those by Division staff. All members of the Force are appointed Deputy Inspectors and their assistance, stationed as they are throughout the length and breadth of Canada, is invaluable.

"Unlicensed premises" refers to premises that are governed by Explosives Regulations Part XIII. This Part limits the quantities which may be stored without a magazine licence to 150 pounds of dynamite and 2,000 detonators, but specifies that such quantities must be stored separately in locked detached stores or suitable receptacles, safely located, and marked "EXPLOSIVES". It is frequently the careless and illegal storage of small quantities that gives rise to accident. Casual purchasers are known to Inspectors by virtue of the sales records which must be maintained by licensed vendors.

Laboratory

During the year 161 samples were received and examined as follows:

Commercial blasting explosives	
(a) for authorization.....	79
(b) factory run-of-work.....	18
Detonating Fuse.....	2
Safety Cartridges.....	16
Fireworks.....	24
For other Government Departments.....	22

The number of blasting explosives submitted for authorization is unusually large and is accounted for by the coming into production of a new manufacturer, and also by an international contract for a section of the St. Lawrence Seaway in which United States explosives were used in part. Re-sampling was necessary in some instances when questions arose regarding certain properties, but finally sixty-six explosives were duly authorized. A complete list of all authorized explosives is given as Appendix E.

Explosives Division

The samples "for other Government Departments" represent assistance rendered in connection with the assessment of hazards in the handling and transportation of explosives and other dangerous goods. Chiefly involved are Department of National Defence, Department of Transport, and the Post Office Department.

Thefts

Reports were received of twenty-seven thefts of explosives, nineteen involving licensed magazines and eight involving unlicensed premises. Total explosives stolen amounted to 2,768 pounds of dynamite and 920 detonators. Those responsible were apprehended in six instances and court action followed.

In some instances the magazines or premises were entered by breaking the padlocks of the doors but in five instances there was evidence of poor security. Two magazines were entered by removing part of the wall covering; these buildings were obviously not sufficiently substantial.

It is of interest to note one reaction that most Inspectors have experienced when they have had occasion to criticize the nature of construction of a temporary magazine from the point of view of security. The owner would say, in effect: "If someone is determined to enter, it is not possible to prevent it". Obviously this is not a valid argument against putting as many obstacles as possible in the way of illegal entry.

Abandoned Explosives

Forty-six reports were received, chiefly through Deputy Inspectors of Explosives of the RCMP, of explosives that had been hidden and forgotten, simply lost, or deliberately abandoned. It is noticeable that many such reports originate when a new owner or tenant takes possession of property and finds explosives thereon. Much too often however it is an accident which gives rise to a report. Of the forty-six instances this year, abandoned explosives were responsible for eleven accidents, mostly to children who found and misused them.

Total quantity of explosives reported abandoned was 2,467 pounds of dynamite and 704 detonators, as well as minor quantities of other explosives.

In a few instances the ownership was established and in four of these, prosecution ensued for violations of the regulations for safe and secure storage. Sometimes explosives are found in the most unlikely places; one of the prosecutions resulted when dynamite was found in the storeroom of a public restaurant.

Destruction of Explosives

There were sixty reports of explosives having been destroyed for various reasons, involving 9,432 pounds of dynamite, 2,196 detonators, and small quantities of other explosives.

Destruction is necessary in most cases of abandonment but there were also twenty-seven reports of necessity to destroy explosives that had become deteriorated through poor or prolonged storage. Two such

instances involved 1,300 and 3,350 pounds of dynamite respectively. One important duty of inspectors is to examine stocks for deterioration and request early use or destruction as necessary.

A quantity of auto joke bombs, cigarette loads and exploding matches was seized and destroyed. Authorization of such devices, designed to trick the unwary, has consistently been refused since the Act came into force and it is therefore illegal to have them in possession. In this instance a novelty dealer had imported them with other goods as "toys" and they had escaped detection at the port of entry.

Prosecutions

There were more prosecutions in 1957 than there have been for some years past. The number was 33 compared with 18 and 19 for 1955 and 1956 respectively. Convictions resulted in 31 cases, one was dismissed, and one is still pending. Offences are classified as follows:

Act, Section 5(4) (storage without licence).....	5
Regulations, Part IV (illegal manufacture).....	1
Regulations, Part VI (illegal road transportation).....	9
Regulations, Part VII (possession of matches in factory)..	1
Regulations, Part VIII (illegal magazine conditions).....	3
Regulations, Part X (illegal sale).....	2
Regulations, Part XIII (illegal storage of small quantities)	12

Fines imposed ranged up to \$200. This fine, with costs of \$131.20, was paid by a construction company that failed, for a second time, to apply for a magazine licence. Three other construction companies and a co-operative were fined up to \$75 for the same offence but in three of these cases there were additional charges involving poor storage conditions.

The case of illegal manufacturer involved a young student who made an explosive by mixing potassium chlorate, sulphur and aluminum powder. An experimental explosion of this very sensitive mixture caused considerable damage and great disturbance in the neighbourhood, but fortunately no one was injured.

The largest fine for illegal transportation was \$100 and involved four charges against a carrier to whom the regulations had been carefully explained by an inspector a year previously. In spite of the warning his vehicle, not bearing "EXPLOSIVES" signs, but carrying explosives, and not carrying a fire extinguisher, was found parked unattended on a busy highway.

Other offences in transportation included: carriage of dynamite and detonators together without adequate separation; carrying explosives on a vehicle without tailgate of sufficient height; transportation without an explosives transportation permit; exceeding the explosives carrying capacity of a vehicle; and transporting explosives in contact with the steel body of the vehicle. A magazine licensee was fined for delivering explosives for transportation when he knew the Regulations would be violated.

Explosives Division

When an employee was found in possession of matches in an explosives factory he was dismissed by the company and charged under Section 70 of Explosives Regulations Part VII. He was convicted and fined \$25 and costs.

Three magazine licensees were convicted and fined, the offences being (a) failing to post an "EXPLOSIVES" warning sign, (b) storing detonators in the same magazine with dynamite, and (c) failing to maintain the site conditions approved in the licence.

Eleven of the prosecutions under Part XIII of the Regulations resulted when explosives in small quantities were found stored otherwise than in a locked "detached store" or "suitable receptacle" properly located and marked "EXPLOSIVES". The other case involved poor housekeeping conditions in a detached store. Fines ranged up to \$50 and costs, but one case was dismissed when the magistrate ruled that the charge should have been laid against a provincial Department of Highways rather than individual employees thereof.

Reports were also received of three prosecutions involving the commission of criminal offences by means of explosives (Criminal Code of Canada) and also of three convictions under municipal by-laws regulating explosives. Two of the latter concerned the sale and use of fireworks and the third involved an offence against a city bylaw concerning storage of blasting explosives.

Accidents

A complete analysis of the reported accidents with explosives appears as Appendix D, Part I. It will be noted that the total from all causes is 111 and this compares with 112 and 113 for 1955 and 1956 respectively. There is however a large decrease in fatalities, 7 only, compared with 22 and 19 for each of the last two years.

There was no very serious accident in **manufacture**. Twelve persons were injured but none seriously. All of the ten accidents occurred in the handling and filling of sensitive initiating explosives into detonating devices. It is now eleven years since there was a fatal accident in a dynamite factory.

No fires or explosions were reported in connection with magazines.

There were four accidents in **conveyance** by road but none resulted in fire or explosion. Details are as follows:

A truck conveying dynamite in British Columbia struck a soft shoulder and was ditched. There was some damage to the vehicle but none to the load and no injuries. The explosives were transferred to another vehicle.

In Alberta a vehicle laden with 2,500 pounds of dynamite collided with a truck being driven in the wrong lane. Again there was some damage to the explosives truck but none to the explosives packages and no one was injured. A relief vehicle completed the journey.

The driver of a tractor-trailer carrying 10,000 pounds of explosives failed to obey a stop sign and collided with a truck at an intersection. The tractor

was damaged but the loaded trailer was detached and delivered with a relief tractor two hours later. There was no damage to the explosives.

When he fell asleep momentarily, the driver of a vehicle carrying 10,000 pounds of explosives lost control. The vehicle penetrated the road fence, descended a steep rock bank and came to rest against a tree. The impact resulted in detachment of the truck body and the explosives packages were so badly damaged that factory re-packing was necessary. Injuries to both driver and co-driver required hospitalization. Fortunately there was no fire or explosion.

These details prove—if proof were needed—that trucks carrying explosives are subject to the same type of accident as any other vehicle. They also prove that, although careful specifications regarding vehicle and load may be laid down by regulation it is human fallibility that usually causes accident. Selection of skilled, competent and careful drivers is of the utmost importance although beyond control of a federal statute. The matter is frequently discussed with licensed transportation companies however and one was recently commended for instituting a “fine or bonus” system based on driver performance.

The number of **misuse** accidents shows a sharp rise in the category of “home-made explosives” and this is due to the teen-age interest in rocketry following the launching of the first earth satellite in October. Attempts to mix propellants and launch home-made rockets became so numerous that it was deemed advisable, near the end of the year, to ask the press to publish a warning of the serious dangers of amateur rocketry and also to emphasize that experimentation with a view to launching a rocket constitutes illegal manufacture under the Explosives Act. This publicity was not accomplished however until early in 1958.

Brief accounts of all thirty misuse accidents are given as Appendix D, Part II. Accidents to children who find and misuse detonators continue to be a source of concern and the Division’s efforts to minimize them, with good support from the manufacturers, is continuous. One accident is of particular interest in illustrating carelessness in the keeping of detonators:

A doctor reported to the RCMP that he had treated a patient who appeared to have been involved in an explosion. The investigation disclosed that the injuries had been sustained while tuning a home radio and that a detonator that had been improvised as a tuning knob had exploded. The victim lost parts of his thumb and two fingers.

Obviously no member of this household recognized the metal tube for what it was—a detonator containing a sensitive explosive. But the unknown original purchaser who must have been familiar with explosives, failed in his duty to store his explosives safely. It is often the casual user of small quantities of explosives whose carelessness or thoughtlessness ultimately results in accident, sometimes long afterwards. Surplus detonators should be either destroyed or returned to the supplier for licensed storage. If it is absolutely essential that detonators be on private premises they must be stored in a securely locked receptacle kept exclusively for the purpose, and marked “EXPLOSIVES”.

APPENDICES

APPENDIX A

SOR/57-84

EXPLOSIVES ACT

Ammonium Nitrate and Fuel Oil Order

P.C. 1957-335

AT THE GOVERNMENT HOUSE AT OTTAWA

THURSDAY, the 14th day of March, 1957.

PRESENT:

HIS EXCELLENCY THE GOVERNOR GENERAL IN COUNCIL

WHEREAS the Acting Minister of Mines and Technical Surveys has recommended that the assembling and blending of ammonium nitrate and fuel oil be allowed subject to certain conditions;

AND WHEREAS by certificate dated January 10th, 1957 the Chief Inspector of Explosives has approved the nature of components and the final explosive product.

THEREFORE, His Excellency the Governor General in Council, on the recommendation of the Acting Minister of Mines and Technical Surveys, pursuant to section 8 of the Explosives Act, is pleased hereby to make the annexed Ammonium Nitrate and Fuel Oil Order.

AMMONIUM NITRATE AND FUEL OIL ORDER

1. Where written permission of the Chief Inspector of Explosives is obtained, a person may assemble and blend ammonium nitrate and fuel oil in open pit mines and quarries for use therein.

2. The Chief Inspector of Explosives shall give permission to a person to assemble and blend the substances mentioned in section 1 only where he is satisfied that,

- (a) the proposed method of assembling and blending is a safe method, and
- (b) the assembling and blending is to be carried out at the proposed blasting site for immediate use.

APPENDIX B

Factories Licensed to Manufacture Explosives, 1957

Owner	Location of Factory	General nature of product
Canadian Industries Ltd.....	Beloeil, Que.....	Blasting explosives, black powders, nitro-compounds.
Canadian Industries Ltd.....	James Island, B.C...	Blasting explosives.
Canadian Industries Ltd.....	Nobel, Ont.....	Blasting explosives.
Canadian Industries Ltd.....	Brainerd, Man.....	Blasting explosives.
Canadian Industries Ltd.....	Brownsburg, Que....	Ammunition, detonators, blasting accessories, fuses, railway torpedoes.
Canadian Industries Ltd.....	Sept Îles, Que.....	Blasting explosives.
Canadian Industries Ltd.....	Calgary, Alta.....	Blasting explosives.
Canadian Safety Fuse Co. Ltd..	Brownsburg, Que....	Safety fuse, detonating fuse, blasting accessories.
Canadian Arsenals Ltd. (inactive).....	Beloeil, Que.....	Time ring fuse powder.
Canadian Arsenals Ltd.....	St. Paul l'Ermite, Que.	Filling military shells and fuses.
Canadian Arsenals Ltd.....	Valcartier, Que.....	Filling military small arms ammunition.
Canadian Arsenals Ltd.....	Valleyfield, Que....	Military explosives, propellants
Du Pont Company of Canada (1956) Ltd.....	North Bay, Ont.....	Blasting explosives.
North American Cyanamid Ltd.	Niagara Falls, Ont...	Nitroguanidine.
T. W. Hand Fireworks Co. Ltd.	Cooksville, Ont.....	Fireworks and military pyrotechnics.
T. W. Hand Fireworks Co. Ltd.	Papineauville, Que...	Fireworks and military pyrotechnics.
Croname (Canada) Ltd.....	Waterloo, Que.....	Toy pistol caps.
Montreal Fireworks Displays and Manufacturing Company..	Ville la Salle, Que...	Display fireworks.
W. F. Bishop & Son Ltd.....	Unionville, Ont.....	Fireworks.
Superior Toy Ltd.....	Dundas, Ont.....	Toy pistol caps.

APPENDIX C

Explosives Imported into Canada, 1957

Class	Division	Description	Quantity
I	.....	Gunpowder.....	56,010 lb.
II	.....	Nitrate Mixtures.....	22,029 lb.
III	.....	Nitro-Compounds:—	
	1	Nitroglycerine Explosives.....	1,366,240 lb.
	2	(a) Propellants.....	9,196 lb.
	2	(b) For use in explosives factories.....	1,068,784 lb.
	2	(c) For other manufacturing purposes.....	4,864,771 lb.
V	1	Fulminates.....	3,414 lb.
VI	1	Primers.....	305,125
	1	Safety Fuse.....	10,800 ft.
	1	Safety Cartridges.....	11,498,896 rounds
	2	Detonating Fuse.....	497,145 ft.
	2	Seismic Explosives.....	62,161 lb.
	3	Detonators.....	152,417
	.....	Miscellaneous.....	32,032 lb.
VII	2	Manufactured Fireworks.....	1,340,161 lb.

Explosives Division

APPENDIX D

Part I

Accidents Involving Explosives During the Calendar Year 1957

Circumstances or Cause	Mines and Quarries			Elsewhere			Total		
	Acci- dents	Kill- ed	In- jured	Acci- dents	Kill- ed	In- jured	Acci- dents	Kill- ed	In- jured
In Use.									
a Delaying too long in lighting fuse.....	8	1	8				8	1	8
b Premature firing of electrical blasts.....	2	1	9				2	1	9
c Not taking proper cover.....	10	1	9	4	2	12	14	3	21
d Projected debris.....	1		1	6		11	7		12
e Returning too soon after blasting.....	3	2	1	1		1	4	2	2
f Improper handling of misfires.....	2		4				2		4
g Rough tamping.....	1		1				1		1
h Ignition of explosives by flames, sparks, etc...									
i Drilling into explosives.....	11		15	3		4	14		19
j Striking unexploded charge in removing debris.....				1		1	1		1
k Preparing charges.....				1		1	1		1
l Using too short a fuse.....									
m Insufficient ventilation after blasting.....	5		5				5		5
n Springing shots.....			3				2		3
o Inadequate guarding.....	2		3	1		1	3		4
p Various.....									
Total.....	47	5	59	17	2	31	64*	7	90
In manufacturing.....							10		12
In keeping.....							4		2
In conveyance (by road).....									
Total.....							14		14
In Misuse									
(a) Detonators.....							15		18
(b) Home-made explosives.....							10		14
(c) Fireworks.....							4		6
(d) Gunpowder.....							1		1
Total.....							30†		39
Miscellaneous.....							3†		4
Total all circumstances.....	47	5	59	17	2	31	111	7	147

* These accidents occurred in circumstances not directly controlled by the Act.

† Brief descriptions of these accidents are given on the following pages.

Misuse of Explosives

Ref. No.	Cause of Accident	Killed	Injured
(a) Detonators			
5-2	A 25-year-old man lost portions of the thumb, index and middle fingers of his right hand when a detonator exploded while he was tuning a radio in his home. Obviously no member of the household recognized the detonator for what it was and it was being used as an improvised tuning knob.....		1
9-2	A 12-year-old boy sustained injury to two fingers when a detonator exploded in his hand. He apparently found the detonator in a construction yard.....		1
1-3	An 11-year-old boy was seriously injured playing with dynamite and detonators. He stripped the paper wrapper from a stick of dynamite, placed a quantity of loose powder thereon, also a detonator, and then set fire to the paper. The explosives had been left hidden in a gravel pit by members of a Provincial Highways Department crew.....		1
9-3	Two juveniles were injured by flying metal fragments when they ignited four detonators by throwing them in a fire. The children had found dynamite and detonators abandoned in woods near their home.....		2
7-4	An 11-year-old boy used a file on a detonator he had found in a rubbish pile on deserted mining premises. He suffered the loss of the thumb and two fingers of his left hand in the resulting explosion.....		1
14-4	An 11-year-old boy lost all but the little finger of his left hand when he tampered with a detonator.....		1
6-5	A 12-year-old boy suffered injury to his eye when he struck a detonator on a rock "to see what would happen" and it exploded. He had found numerous detonators which had been thrown into a swamp following theft from unlicensed premises.....		1
15-5	A boy was seriously injured by a single detonator he found in a cattle corral. The source of the detonator was not discovered but it was known that an oil exploration crew had worked in the vicinity five years previously.....		1
24-5	An explosion in burning refuse caused injury to one person. Apparently a detonator was involved, abandoned in the refuse.....		1
9-7	Three young men in their early 20's sustained very serious injuries when they misused detonators, and about 60 exploded simultaneously. They had found the detonators abandoned at an old mine site. One man lost the use of both hands and a second sustained serious injury to his sight as well as the loss of a hand.....		3

Explosives Division

Misuse of Explosives

Ref. No.	Cause of Accident	Killed	Injured
2-8	A boy broke into an uninhabited farmhouse and stole one detonator. He struck it between two stones and received serious injuries to his hands.....		1
11-8	A boy found a detonator near the waste dump of a mining community. He experimented by striking it with a hatchet and the resulting explosion caused injuries to his right hand and chest.....		1
4-9	Four boys aged 10 to 12 years forced the door to a shack on construction premises and stole detonators. One boy was injured when the detonators were thrown on a bonfire.....		1
12-11	A 10-year-old boy lost three fingers and part of a thumb when he applied a lighted match to a detonator which he held in his left hand. He had found detonators in the loft of a garage.....		1
13-11	A detonator exploded when a 14-year-old boy investigated its contents with a straight pin; he lost three fingers. Detonators had been found in an abandoned shack.....		1
(b) Home-Made Explosives			
11-1	A home-made "bomb" being built by two youths accidentally exploded injuring both severely. One lost his left hand ..		2
3-5	It was necessary to amputate the left hand of a teen-aged boy following the explosion of a home-made "bomb" in his basement work-shop. A copper pipe had been filled with an explosive mixture and he was closing the end with a hammer.....		1
19-9	Doctors performed an emergency operation on a 15-year-old youth when his thigh was pierced with a copper fragment from an exploding home-made rocket. Police said ingredients of the "propellant" used had been purchased at drug stores.....		1
20-9	Four boys, experimenting with chemicals mixed in a steel tube, were blown off their feet when the device exploded. One boy was gashed on the head by flying metal. The boys told police they had ignited a mixture made from a chemistry set.....		1
9-10	A home-made "gun", loaded with powder extracted from firecrackers, exploded, resulting in eye injury to a 13-year-old boy. He had tried to fire the gun, a brass tube attached to a "handle", by igniting a fuse inserted in the "barrel".....		1

Misuse of Explosives

Ref. No.	Cause of Accident	Killed	Injured
11-10	Two youths sustained leg injuries when a miniature rocket exploded while under construction in a basement. The "propellant" consisted of potassium chlorate, sulphur and charcoal. Apparently the ingredients had been purchased at a local drug store.		2
14-11	A young boy sustained injuries to his hand when a home-made bomb exploded while he was holding it. He had apparently poured powder from firecrackers into a nine-inch piece of $\frac{3}{4}$ -inch pipe and then ignited it.		1
7-12	A rocket-propulsion device culminating three years of work by two teen-agers blew up on its initial test, injuring both. One sustained a severe leg gash requiring hospitalization and his companion suffered leg cuts.		2
10-12	A 16-year-old youth sustained eye injury and lacerations to his right hand and leg during attempts to launch a home-made rocket. The device exploded as the youth was lighting the fuse with a paper torch. Chemical ingredients were said to have been obtained from drug stores.		1
11-12	Two 12-year-old boys were injured at an unsuccessful launching of a home-made rocket. Fragments of metal flew in all directions and it was very fortunate that bystanders escaped injury. One of the two designers was struck dangerously near his eye and the second also sustained facial injury. Shock of the explosion was said to be felt through a considerable area. The "rocket" consisted of a 16-inch length of copper pipe equipped with metal wings and tail fins.		2
(c) Fireworks			
14-5	A 12-year-old boy lost the sight of an eye when he tossed a lighted firecracker into a bottle.		1
19-5	An 8-year-old was painfully injured when a firecracker exploded in his pocket.		1
9-6	Three teen-aged boys suffered face and body injuries by an explosion which was not explained but it was known they had been setting off firecrackers. Home-made explosives may also have been involved.		3
22-7	An 8-year-old boy was severely burned by a package of firecrackers. He was carrying the firecrackers in his back pocket when another child ignited them.		1

Explosives Division

Misuse of Explosives

Ref. No.	Cause of Accident	Killed	Injured
<i>(d) Gunpowder</i>			
18-1	A 14-year-old boy suffered extensive injuries to his face as the result of an explosion of gunpowder. He emptied a shot-gun shell into a glass jar and ignited the powder with a match.....		1
<i>Miscellaneous</i>			
14-8	A juvenile sustained serious eye injuries when a railway track torpedo with which he was playing exploded. Torpedoes had been taken from an abandoned railway caboose.....		1
4-6	An adult and a child were seriously injured by flying rock from a blast in connection with St. Lawrence Seaway construction operations.....		2
6-6	A miner was injured when he picked up a lighted fused detonator to throw it in a ditch and it exploded. It was reported two other miners had thrown the detonator near the injured man "as a joke to scare him".....		1

*Authorized Explosives**Canadian Industries Limited (Explosives Division)*

Amex
 Ammonia Dynamite—20, 25, 30, 35, 40, 50 and 60 per cent.
 Ammonia Dynamite, Agricultural—60 per cent (for export only).
 Ammonia Dynamite Extra 40, 50, 60 and 70 per cent (for export only).
 Ammonia Dynamite, Free Running—40, 65 per cent.
 Ammonia Dynamite, High Density—20, 25, 30, 35, 40, 50, 60 per cent (for export only).
 Ammonia Dynamite, Low Density—20, 25, 30, 35, 40, 50, 55, 60 per cent (for export only).
 Ammonia Dynamite, Quarrying—60 per cent.
 Ammonia Dynamite, Seismograph—60 per cent (for export only).
 Ammonia Dynamite, Stumping—20 per cent (for export only).
 Ammonia Gelatin 30, 35, 40, 50, 60, 75, 80, 90 per cent (for export only).
 Black Blasting Powder.
 Black Sporting Powder.
 Blastol—60 per cent.
 BRX-7-75 per cent.
 Cilgel—50 per cent.
 C.I.L. Dynamite Nos. 2, 3, 4 and 5.
 Cordite—MD, MDT, W, WT, WM, WMT.
 C-X-L Dynamite—Nos. 1 and 5.
 C-X-L Gelatin—Nos. 1 and 2.
 C-X-L-lite.
 Di-Drill Gelatin—60 per cent.
 Ditching Dynamite—50 per cent.
 Driftite—70 per cent.
 Dygel—75 per cent.
 Dynamex—40, 50, 60 and 70 per cent.
 EXEL-G—75%.
 EXEL-S—75%.
 Explosives BL-100—60 per cent.
 BL-103
 BL-106
 BL-111
 BL-112
 BL-114
 BL-115
 BL-116
 BL-118
 Forcite—30, 35, 40, 50, 60, 75, 80 and 90 per cent.
 Fuse Powders—30, 40, 44, 53, 57 and 65 seconds.
 Gelatin Dough—90 per cent.
 Gelatinized Dynamite 60, 75 per cent (for export only).
 Geogel
 Gelignite—34, 42, 51, 62 per cent (for export only).
 Giant Gelatin—30, 35, 40, 50, 60, 75, 80 and 90 per cent.
 Guhr Dynamite.
 Guncotton.
 Gunpowder.
 Gypsumite "A", "B" and "C",
 Hi-Velocity gelatin 40, 60, 75 and 80 per cent.
 Liquid Nitroglycerine.
 Lump-Kol Pellet Powder.
 Monobel, Nos. 4, 6, 7, 10, 11 and 14.
 Monobel, sheathed—Nos. 4, 7 and 10.
 Monobel, X(EQ.S.).
 Nitrocotton.
 Nitrone T-1, T-3 and T-4.

Explosives Division

Canadian Industries Limited (Explosives Division)—Continued

Nitrone Primer.
Nitrone S-1.
Nitrone S-1 Primer.
Nitropel.
Nitrox.
Pellet Powder No. 2.
Pentolite Primers.
Polar Stumping Powder—20 per cent.
Pyromex.
Seismic Gelatin—60 per cent (for export only).
Semi-Gelatin No. 1, 2, 3, 4 and 5 (for export only).
Signal Bombs.
S.N.G.
"Special No. 1" Dynamite.
Stopeite, 20, 25, 30, 35, 40, 50, 55 and 60 per cent.
Straight Gelatin—25, 30, 35, 40, 50, 60, 75, 80, 90 per cent (for export only).
Submagel—60, 75 and 95 per cent.
Trinitrotoluene.
Vibrex—60 per cent.

Canadian Safety Fuse Co. Ltd.

"B-Line" detonating fuse.
Safety fuse—"Beaver" Brand.
Safety fuse—"Black Clover" Brand.
Safety fuse—"Black Pacific" Brand.
Safety fuse—"Clover" Brand.
Safety fuse—"Crown" Brand.
Safety fuse—"Moose" Brand.
Safety fuse—"Pacific" Brand.
Safety fuse—"White Jacket" Brand.
Safety fuse—"Yellow Jacket" Brand.
Hot Wire Fuse Lighters.
Igniter Cord—"Thermalite" Brand. Types A and B.
"Primacord" Detonating Fuse.
Plastic "Primacord" Nos. 4 and 5.

Canadian Industries Limited (Ammunition Division)

Ammunition.
Detonating Fuse Primer.
Detonators.
Dextrinated Lead Azide.
Fuse Igniting and Connecting device.
Gasless Delay Electric Blasting Cap, X-107.
"Lead Salt".
Lead Styphnate (Normal).
MS Detonating Relay.
Percussion Caps.
Railway Fuses.
Railway Torpedoes.
Safe-T-Lite Highway Fuses.
Styphnic Acid.
"SURESHOT" Booster.
Tetrazene.
Igniter Cord Electric Starter.

DuPont Company of Canada (1956) Limited, Montreal, Que.

DuPont Ditching Dynamite.
DuPont Extra Nos. 1, 2, 3, 4 and 5.
DuPont Gelatin—25, 40, 50, 60, 75 per cent.
DuPont Stumping Dynamite.

DuPont Company of Canada (1956) Limited, Montreal, Que.—Continued

Energex—40, 50, 60 per cent.
Energex FR—25, 40, 65 per cent.
Energite—40, 50, 60 per cent.
Gelex-A, 1, 2 and 3.
Hi-Velocity Gelatin, 40 and 60 per cent.
Special Gelatin—30, 35, 40, 50, 60, 75, 80 and 90 per cent.
Submarine Hi-Velocity Gelatin—60 and 80 per cent.

North American Cyanamid Ltd., Niagara Falls, Ont.
Nitroguanidine.

Pursuant to Section 8 of the Act, ammonium nitrate blended with fuel oil is an authorized explosive.

Authorized explosives manufactured by other than Canadian firms:—

Aerojet Engineering Corporation, Azusa, Calif.
Aeroplex AK14 Propellant.

Aktiebolaget Bofors, Nobelkrut, Bofors, Sweden.
Smokeless Sporting Powder.
Detonating Fuse, (Bofors type).

American Cyanamid Co., Latrobe, Pa.
Fulminate of Mercury.
Detonators.

Atlas Diesel Co., Stockholm, Sweden.
Engine Starting Cartridges.

Atlas Powder Co., Wilmington, Del.
Atlas Gelatin 60 per cent and 75 per cent.
Detonators.
Giant Gelatin—40, 60 and 75 per cent.
Giant Gelatin High Velocity 60 per cent.
Shaped Charges.

Austin Powder Co., Cleveland, Ohio.
Black Pellet Powder.

Leon Beaux & Co., Societa Italiana Munizioni, Milano, Italy.
Small arms ammunition.

Bermite Powder Co., Saugus, Calif.
Baker Powder Charge No. 661.
Firing Head Igniter—Product No. 660.

Cardox Corporation, Chicago, Ill.
Cardox.
Cardox Heaters.

Cartoucherie Française, Paris, France.
.22 Blank Cartridges.

Cascade Cartridge Co., Lewiston, Idaho.
Primers.

De Kruithoorn N.V. Nederlandsche Jachtpatroonfabriek, 'sHertogenbosch, Holland.
Shotgun Shells 12, 16, 20 gauge.

Explosives Division

Deutsche Jagdpatronenfabrik G.M.B.H. 14 (b) Rottweil a.N. West Germany.
Shotgun Cartridges.

E.I. DuPont de Nemours & Company, Inc., Wilmington, Del.

Auxiliary Charges C. 63.
Detonators.
DuPont Bulk Powder.
DuPont Ditching 50 per cent.
DuPont Extra—A, C, E, F, G.
DuPont Gelatin—25, 40, 50, 60, 75 per cent.
DuPont Pistol Powder No. 6.
Explosive Rivets.
Fulminate of Mercury.
F.N. H. Ground Smokeless Powder.
Gelex—Nos. 1, 2, 3.
High Temperature E.B. Caps, No. 6.
Hi-Velocity Gelatin—40, 60, 75 per cent.
Improved Military Rifle Powders.
Jet Tappers.
Nitramon A.
Nitramon 2.
"Nitramon S".
"Nitramon S" Primers.
Nitramon Primer.
"Nitramex" No. 2.
Nitramex 2H.
Nitramite.
Nitramite Primer.
Nitrocellulose.
Nitrostarch.
Oil Well Explosives S.O.W.E. No. 1 and EL-431-A.
Open Hole Shaped Charges (R.D.X. or Pentolite).
P.6 Seismograph Booster.
"Pelletol" Nos. 1 and 2.
Perforating Shaped Charges (R.D.X. or Pentolite).
P.E.T.N.
"Primacord" Booster.
"Primacord" MS Connectors.
Pyro (ground smokeless) Powder.
Red Cross Extra—40, 50, 60 per cent.
Red Cross Extra (H.W.R.) 40, 50, 60 per cent.
Smokeless Powders.
Special Gelatin—30, 40, 50, 60, 75, 80, 90 per cent.
Special Primer with Booster (4 x 7.5 lb.).
Sporting Rifle Powders.
Submarine Hi-Velocity Gelatin—60, 80 per cent.
Tetryl.
Waterproof Boosters C. 66.

Dynamit-Actien-Gesellschaft, Nurnberg 2, Germany.

RWS—Flobert Blank Cartridges.
No. 6 Detonators (copper case).
No. 7 Detonators (copper case).
No. 8 Detonators (copper case).
No. 6 Detonators (aluminum case).
No. 7 Detonators (aluminum case).
No. 8 Detonators (aluminum case).
Delay Electric Detonators, 0-10, No. 8 (copper case).
Delay Electric Detonators, 0-10, No. 8 (aluminum case).
Millisecond Delay Electric Detonators, 0-10, No. 8 (copper case).
Millisecond Delay Electric Detonators, 0-10, No. 8 (aluminum case).
Detonating Fuse "Nobel Cord".
R.W.S. Rimfire Cartridges.

- Ellefsens Tendskruefabrikk, Stokke, Norway.*
Time Fuses and Detonators for Whaling Guns.
- Ensign Bickford Company, Simsbury, Conn.*
Ignitacord.
"Primacord-Bickford" Fuse.
- ETS. Brandt, La Ferte St. Aubin (Loiret) France.*
Shaped Charges 3 $\frac{3}{8}$ " & 5".
- ETS. Billant, Usine Du Prado, Bourges 9 (Cher) France.*
Shaped Charges 3 $\frac{3}{8}$ ".
- Federal Cartridge Corporation, Minneapolis 2, Minn.*
Shotgun Cartridges.
- Federal Laboratories, Pittsburgh, Pa.*
Lachrymatory Cartridges.
Powder Loads.
- Gevelot, S.A., 50 Rue Ampere, Paris 17, France.*
Shotgun Cartridges.
- Giullio Fiocchi, Lecco, Italy.*
Power Tool Cartridges, Q 4.
Metallic Cartridges, Cal. 9 mm short and 7.63 mm Mauser.
Shotgun Cartridges, 12 gauge and 24 gauge.
Shot Shell Primers and Percussion Caps.
- Go Oil Well Services Inc., Fort Worth, Texas.*
Jet Perforators.
- Hercules Powder Company, Wilmington, Del.*
Detonators.
Gelatin Oil Well Explosive.
Explosive E.P. 172-2.
Gelumite D.
Gelatin Extra—60 per cent.
High Pressure Gelatin—60 per cent.
Nitrocellulose.
Smokeless Powders.
Vibro Caps.
Vibrogel B and 3.
- Hull Cartridge Co., Hull, Yorkshire, England.*
Shotgun Cartridges, 12 gauge.
- Illinois Powder Manufacturing Co., St. Louis, Mo.*
"Western Spiral-Pack" Electric Detonators.
Gold Medal Oil Well Explosive 100 per cent.
- Imperial Chemical Industries Limited, England.*
Cerium Low Tension Fuseheads.
Detonating Relays.
Percussion Caps.
Black Sporting Powders FG, FFG, FFFG and NFFFG.
Fireworks Powders, Cannon, Meal.
Black Whaling Powder.
Saluting Powder.

Explosives Division

Imperial Chemical Industries Limited, England.—Continued

Gunpowder G-7, G-12, G-20.
Gunpowder SFG-12, SFG-20, Sulphurless mealed.
Smokeless Whaling Charges.
Tetryl.
Detonators.
Pentaerythritol Tetranitrate (P.E.T.N.).
Safety Cartridges.
Smokeless Powder.

Jet Guns Company, Neil P. Anderson Bldg., Fort Worth, Texas.

Shaped Charges, $1\frac{3}{4}$ " , $2\frac{3}{8}$ " .
Glass Gun Perforating Charges, G.G. 2, G.G. 4, G.G. 7.

Kemode Manufacturing Co. Inc., New York, N.Y.

"Quik-Shot" Cartridges.

Kilgore Incorporated, Westerville, Ohio.

Flashlight Cartridges.

King Powder Co., Cincinnati, Ohio.

Black Pellet Powder.

Lake Erie Chemical Co., Cleveland, Ohio.

Lachrymatory Cartridges.

Lane-Wells Co., Los Angeles, Calif.

Gun Perforator Cartridges.

Mid Continent Torpedo Co. Ltd., Tulsa, Okla.

Red Head Firing Heads.

Nitroglycerin Aktiebolaget, Gyltorp, Sweden.

Shotgun Tracer Cartridges.

A.B. Norma Projektilfabrik, Amotfors, Sweden.

Safety Cartridges.

Olin Mathieson Chemical Corp., East Alton, Ill.

Cyclonite.
Detonators.
Kiln Gun Shells.
Linemen's Flare Lights.
Normal Lead Styphnate.
Railway Fusees.
Railway Torpedoes.
Western Ball Powder.
"Western" Small Arms Ammunition.
"Winchester" Small Arms Ammunition.

SV Olsen, Valby Tingsted, 10 Kobenhavn VBY, Denmark.

Toy Pistol Caps (Six-Shot discs.)

T. Page-Wood Limited, Bristol, England.

Safety Cartridges.

Patronenfabrik, A.C., Solothurn, Switzerland.
Safety Cartridges 7.5 mm.

Perforating Guns Atlas Corporation, Houston, Texas.
Jet Perforating Charges.

Poudreries Nationales, France.
D-2 Propellant Powder.

Pringle Powder Company, Bradford, Pa.
Liquid Nitroglycerine.

Remington Arms Co. Inc., Bridgeport 2, Conn.
Stud Driver Cartridges.
"Remington" Small Arms Ammunition.
"Peters" Small Arms Ammunition.
"Springfield" Small Arms Ammunition.

F. J. Roberts Squib Company, Punxsutawney, Pa.
Miners' Safety Squibs.

Rohm-Gesellschaft, Sontheim/Brenz, Kreis Heidenheim, Germany.
6 mm. Blank Cartridges.
RG-3 Signal Cartridges.

Shaped Charge Explosive Manufacturers, Inc., Martinsburg, W. Va.
Plurajet Blasting Units (Not for underground use).

Standard Railway Fusee Corporation, Boonton, N.J.
Railway Torpedoes.

Trojan Powder Company, Allentown, Pa.
Nitrostarch.
Trojan 40 per cent S, 50 per cent S, ESX, ESX-LD, PT-3X, TL-501-B.

Winchester Arms Company, Cleveland, Ohio.
"Tempotool" Cartridges.

Authorized Manufactured Fireworks

Fireworks manufactured by the following Canadian makers are authorized:

W. F. Bishop & Son Limited, Toronto, Ont.
Canadian Industries Limited, Montreal, Que.
Canadian Safety Fuse Company Limited, Brownsburg, Que.
Croname (Canada) Ltd., Waterloo, Que.
Dominion Fireworks Co. Ltd., Dixie, Ont.
T. W. Hand Fireworks Co. Ltd., Cooksville, Ont., and Papineauville, Que.
Montreal Fireworks Displays and Manufacturing Co., Ville St. Pierre, Que.
Superior Toy Limited, Dundas, Ont.

Explosives Division

Certain fireworks manufactured outside of Canada by the following makers are authorized.*

Acme Fireworks Corporation (Acme Novelty Manufacturing Company) River Grove, Ill.
Aerial Products Incorporated, Merrick, Long Island, N.Y.
American Railway Signal Company, Fostoria, Ohio.
Anthes Force Oiler Company, Fort Madison, Iowa.
Astra Fireworks Ltd., London, England.
Atlas Fireworks Co. Inc., Los Angeles 22, Calif.
M. Backes' Sons Inc., Wallingford, Conn.
J. G. W. Berchholtz, Hamburg-Bahrenfeld, Germany.
Hermann Bischoff, Bremen, Germany.
Oswald Bradley Ltd., Southport, Lancs., England.
C. T. Brock & Co., Hemel Hempstead, Herts, England.
Brookside Pyrotechnic & Chemical Co., Elkton, Md.
Contimetal Industry (Hemel Hempstead) Ltd., Hemel Hempstead, Herts, England.
EM-GE Sportgerate K-G Gerstenberger & Co., Wurttemberg, Germany.
J. Halpern Co., Pittsburgh, Pa., Distributors for Lenover Corporation, Chester, Pa. and Lenover, Pa.
Thos. Hammond & Company, Craigmillar, Edinburgh, Scotland.
Hitt Fireworks Company Limited, Seattle, Wash.
Hudson Fireworks Display Company, Hudson, Ohio.
Illinois Fireworks Co., Danville, Ill.
Interstate Fireworks Manufacturing and Display Company, Bridgewater, Mass.
Japan Fireworks Trading Company Ltd., Tokyo, Japan.
Jatina Manufacturing Co. Inc., Mount Vernon, N.Y.
Keystone Fireworks Manufacturing Co. Inc., Dunbar, Pa.
Kilgore Incorporated, Westerville, Ohio.
Lakeside Railway Fusee Company, South Beloit, Ill.
Lenover Corporation, Chester, Pa., and Lenover, Pa., J. Halpern, Pittsburgh, Pa. Distributors.
Oscar Lunig, Stuttgart-Mohringen, Germany.
Marutamaya Ogatsu Fireworks Co., Tokyo, Japan.
C. Schauer Nachfolger, Berlin, Germany.
National Fireworks Incorporated, West Hanover, Mass.
New Jersey Fireworks Mfg. Co. Inc., Elkton, Md.
Olin Mathieson Chemical Corporation, New Haven, Conn.
N. V. Pyro, Klazienaveen, Holland.
Pyrotechnischen Fabriken, Wuppertal-Ronadorf, Germany.
Pyrowerk, Hamburg-Neugraben, Germany.
Reliance Snap Company, Bishop's Stortford, Herts, England.
Richard Appel's Jo King, New York 12, N.Y.
Saburo Inagaki, Okazaki City, Japan.
Saburo Ishibashi, Tokyo, Japan.
Schermuly Pistol Rocket Apparatus Ltd., Newdigate, Surrey, England.

* A list of authorized fireworks is on file in the office of the Explosives Division. Information may be obtained on request.

Report for 1957

Standard Fireworks Limited, Huddersfield, England.
Standard Railway Fusee Corporation, Boonton, N.J.
Stehling and Co., Hamburg 11, Germany.
The J. & E. Stevens Sales Co., New York, N.Y.
Superior Signal Co., Incorporated, South River, N.J.
United Fireworks Manufacturing Company, Dayton, Ohio.
U.S. Fish and Wildlife Service, Pocatello, Idaho.
Van Karner Chemical Arms Corporation, New York.
Messrs. Waeco Ltd., High Post, Salisbury, England.
Joseph Wells & Son Limited, Dartford, Kent, England.
Joh. Chr. Wendt. Hamburg, Gr. Borstel, Germany.
Wunderkerzen-Werk Carl Flemming, Hamburg-Neugraben, Germany.
Yuki Node, Shimozuma-Machi, Makabe-Gun Ibaragi-Prefecture, Japan.

Chinese Firecrackers with gunpowder composition and not exceeding 4" in length and $\frac{9}{16}$ " in diameter, and small Chinese Fireworks, are authorized when found to function satisfactorily on examination at port of entry.

